METHODS, SYSTEMS, AND COMPUTER PROGRAM PRODUCTS FOR TRANSMITTING STREAMING MEDIA TO A MOBILE TERMINAL USING THE BANDWIDTH ASSOCIATED WITH A WIRELESS NETWORK

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FIELD OF THE INVENTION

[1] The present invention relates to communication networks, and, more particularly, to wireless communication networks.

BACKGROUND OF THE INVENTION

[2] The Internet has expanded the accessibility of local radio and/or television stations to virtually any location in which a listener/viewer can establish an Internet connection. This has changed the way people listen to radio and/or watch television, particular for events, such as sporting events. The Internet has made it possible for a sports fan, for example, to listen to or perhaps even view, a game involving his or her favorite team live even if the fan is not within the physical broadcast range of a radio or television station's transmitter. Unfortunately, it may be difficult to take advantage of such a broadcast over the Internet when away from home or other location having Internet access. Moreover, viewing or listening to such real time events over a low bandwidth Internet connection, such as a dial-up connection, may provide an unsatisfactory viewing and/or listening experience.

SUMMARY OF THE INVENTION

[3] According to some embodiments of the present invention, a communication network is operated by providing a wireless communication network that has bandwidth associated therewith to facilitate communication between one or more mobile terminals and another communication device. Streaming media is transmitted to the one or more mobile terminals using the bandwidth associated with the wireless network.

[4] In accordance with other embodiments of the present invention, transmitting the streaming media comprises using third generation (3G) wireless communication technology. Wideband code division multiple access (WCDMA) technology, universal mobile telecommunications system (UMTS) technology, and/or enhanced

data GSM (global system for mobile communications) environment technology may be used in accordance with various embodiments of the present invention.

[5] In accordance with still other embodiments of the present invention, the wireless communication network comprises a Wi-Fi communication network and the streaming media may be transmitted using IEEE 802.11b technology.

[6] In accordance with further embodiments of the present invention, the streaming media comprises text, audio and/or video content.

[7] In accordance with still further embodiments of the present invention, the streaming media comprises content from a television broadcast, an amplitude modulation (AM) radio broadcast, a frequency modulation (FM) radio broadcast, a video conference, and/or a gaming application.

[8] In accordance with other embodiments of the present invention, the streaming media may be transmitted to one or more mobile terminals using the bandwidth associated with the wireless network while the one or more mobile terminals move between cells associated with the wireless network.

[9] In accordance with still other embodiments of the present invention, authorization to rebroadcast the streaming media over the wireless network may be obtained from a media broadcaster that provides the streaming media. Subscriptions may be obtained at the wireless network from the one or more mobile terminals to receive the streaming media.

[10] Although described above primarily with respect to method embodiments of the present invention, it will be understood that the present invention may be embodied as methods, systems, and computer program products.

[11] Other systems, methods, and/or computer program products according to embodiments will be or become apparent to one with skill in the art upon review of the following drawings and detailed description. It is intended that all such additional systems, methods, and/or computer program products be included within this description, be within the scope of the present invention, and be protected by the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[12] Other features of the present invention will be more readily understood from the following detailed description of specific embodiments thereof when read in conjunction with the accompanying drawings, in which:

[13] **FIG. 1** is a schematic that illustrates a communication network that includes a wireless network in accordance with some embodiments of the present invention;

[14] **FIG. 2** is a block diagram that illustrates a mobile terminal in accordance with some embodiments of the present invention; and

[15] **FIG. 3** is a flowchart that illustrates operations of a communication network in accordance with some embodiments of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

[16] While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof are shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that there is no intent to limit the invention to the particular forms disclosed, but on the contrary, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the claims. Like reference numbers signify like elements throughout the description of the figures.

[17] The present invention may be embodied as systems, methods, and/or computer program products. Accordingly, the present invention may be embodied in hardware and/or in software (including firmware, resident software, micro-code, *etc.*). Furthermore, the present invention may take the form of a computer program product on a computer-usable or computer-readable storage medium having computer-usable or computer-readable program code embodied in the medium for use by or in connection with an instruction execution system. In the context of this document, a computer-usable or computer-readable medium may be any medium that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

[18] The computer-usable or computer-readable medium may be, for example but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a nonexhaustive list) of the computer-readable medium would include the following: an electrical connection having one or more wires, a portable computer diskette, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), an optical fiber, and a portable compact disc read-only memory (CD-ROM). Note that the computer-usable or computer-readable medium could even be paper or another suitable medium upon

which the program is printed, as the program can be electronically captured, via, for instance, optical scanning of the paper or other medium, then compiled, interpreted, or otherwise processed in a suitable manner, if necessary, and then stored in a computer memory.

[19] Referring now to **FIG. 1**, an exemplary communication network **100**, in accordance with some embodiments of the present invention, comprises a media broadcaster **105** that may broadcast streaming media content, such as, for example, amplitude modulation (AM) radio broadcasts, frequency modulation (FM) radio broadcasts, video conference broadcasts, gaming application broadcasts, Webinars, and the like to radios **110** and/or television sets **120** over an air interface, in accordance with some embodiments of the present invention. In other embodiments, the media broadcaster **105** may broadcast streaming media content as described above to radios **125** and television sets **130** over a wireline network **135**, such as a cable network. As used herein, "streaming media" means a continuous supply of data, such as audio, video, and/or text data. The data may be supplied from a source location, such as the media broadcaster **105**, to an end user. Streaming media may allow a user to listen to and/or view content instantly instead of requiring the user to download an entire file first before it may be listened to and/or viewed.

[20] As shown in **FIG. 1**, the media broadcaster **105** may also provide the streaming media content discussed above to a wireless network **140** through a base station transceiver **145**. In accordance with various embodiments of the present invention, the media broadcaster **105** may provide the streaming media content to the base station transceiver **145** using an air interface and/or using the wireline network **135**.

[21] The base station transceiver **145** communicates with one or more mobile terminals **155** via an air interface. The base station transceiver may be associated with a service "sector" and/or cell. As used herein, the term "mobile terminal" may include a cellular radiotelephone with or without a multi-line display; a Personal Communications System (PCS) terminal that may combine a cellular radiotelephone with data processing, facsimile and data communications capabilities; a personal digital assistant (PDA) that can include a radiotelephone, pager, Internet/intranet access, Web browser, organizer, calendar and/or a GPS receiver; and a conventional laptop and/or palmtop receiver or other appliance that includes a radiotelephone transceiver. Access terminals may also be referred to as "pervasive computing" devices.

[22] **FIG. 2** illustrates a mobile terminal **200** that may be used in embodiments of the mobile terminal **155** of **FIG. 1**, in accordance with some embodiments of the present invention. The mobile terminal **200** comprises a keyboard/keypad **202**, a display **204**, a transceiver **206**, a memory **208**, a microphone **210**, and a speaker **212** that communicate with a processor **214**. The transceiver **206** typically comprises a transmitter circuit **216** and a receiver circuit **218**, which cooperate to transmit and receive radio frequency signals to base station transceivers via an antenna **220**. The radio frequency signals transmitted between the mobile terminal **200** and the base station transceivers may comprise both traffic and control signals (*e.g.*, paging signals/messages for incoming calls), which are used to establish and maintain communication with another party or destination. The radio frequency signals may also comprise packet data information, such as, for example, cellular digital packet data (CDPD) information. The foregoing components of the mobile terminal **300** may be included in many conventional mobile terminals and their functionality is generally known to those skilled in the art.

[23] The processor **214** communicates with the memory **208** via an address/data bus. The processor **214** may be, for example, a commercially available or custom microprocessor. The memory **208** is representative of the one or more memory devices containing the software and data used to operate the mobile terminal **200** and to facilitate reception of streaming media. The memory **208** may include, but is not limited to, the following types of devices: cache, ROM, PROM, EPROM, EEPROM, flash, SRAM, and DRAM.

[24] As shown in **FIG. 2**, the memory **208** may contain up to two or more categories of software and/or data: the operating system **222** and the streaming media interface **224**. The operating system **222** generally controls the operation of the mobile terminal **200**. In particular, the operating system **222** may manage the mobile terminal's software and/or hardware resources and may coordinate execution of programs by the processor **214**. The streaming media interface **224** may be configured to allow a user or consumer to subscribe at the wireless network **140** to one or more streaming media services that are obtained from the media broadcaster **105** and are rebroadcast by the wireless network **140**. In addition, the streaming media interface **224** may be configured to tune into or select streaming media broadcasts provided through the wireless network **140**.

[25] Although **FIG. 2** illustrates an exemplary software architecture that may be used to facilitate subscription to and reception of streaming media content in a mobile terminal, it will be understood that the present invention is not limited to such a configuration but is intended to encompass any configuration capable of carrying out the operations described herein.

[26] Returning now to **FIG. 1**, the mobile terminal **155** communicates via the base station transceiver **145**. As used herein, the term "communicate" means transmit, receive, and/or both transmit and receive. A function of the base station transceiver **145** is to handle radio communication with the mobile terminal **155**. In this capacity, the base station transceiver **145** may function as a relay station for data and/or voice signals. Thus, the base station transceiver **145** may comprise a receiver and a transmitter. For purposes of illustration, only one base station transceiver **145** and one mobile terminal **155** are shown in **FIG. 1**. It will be understood, however, that the wireless network **140** may comprise hundreds of base station transceivers **145** respectively associated with hundreds of sectors or cells, and may serve thousands of mobile terminals. In addition to the base station transceiver **145**, the wireless network **140** comprises a base station controller **150**. The base station transceiver **145** also communicates with the base station controller **150**. The base station controller **150** may comprise stored program control and processor resources for managing the wireless network **140**.

[27] To facilitate communication of streaming media content between the base station transceiver and one or more mobile terminals **155**, the wireless network may use third generation (3G) wireless communication technology as the air interface between the base station transceiver **145** and the one or more mobile terminals **155**. 3G is the name given to wireless network technology that may provide relatively high speed bandwidth to mobile terminals. Specifically, 3G networks support data rates of up to 2.05 Mbits/sec for stationary terminals, up to 384 Kbits/sec for slowly moving terminals, and up to 128 Kbits/sec for relatively fast moving devices, such as mobile terminals in moving vehicles.

[28] In accordance with various embodiments of the present invention, the 3G wireless communication technology may be wideband code division multiple access (WCDMA) technology, universal mobile telecommunications system (UMTS) technology, and/or enhanced data global system for mobile communications (GSM) environment (EDGE) technology. WCDMA is based on the CDMA IS-95 standard

and can support data rates of up to 2 Mbits/sec for local area access or 384 Kbits/sec for wide area access. UMTS also supports data rates of up to 2 Mbits/sec and also may provide broadband services to mobile terminals throughout the world using fixed, wireless, and/or satellite networks. EDGE is a faster version of the GSM wireless standard and may support data rates up to 384 Kbits/sec. In other embodiments of the present invention, the wireless network **140** may comprise a Wi-Fi communication network. Wi-Fi networks use radio communication technologies based on the IEEE 802.11b standard to provide data rates of up to 11 Mbits/sec.

[29] Advantageously, the present invention may allow mobile terminals to receive streaming media content while allowing a user to remain free to move about and conduct his or her daily activities. That is, a user may carry a mobile terminal between cells or sectors associated with a wireless network while seamlessly listening to a streaming media broadcast delivered over the bandwidth associated with the wireless network. In accordance with various embodiments of the present invention, streaming media content that is delivered over the Internet could be rebroadcast to a mobile terminal through the bandwidth of the wireless network if the mobile terminal has the appropriate capabilities for displaying the streaming media content, *e.g.*, video and/or audio capabilities.

[30] Although **FIG. 1** illustrates an exemplary communication network **100** architecture, it will be understood that the present invention is not limited to such a configuration, but is intended to encompass any configuration capable of carrying out the operations described herein.

[31] Referring now to **FIG. 3**, operations for providing streaming media content to a consumer through a mobile terminal, in accordance with some embodiments of the present invention, will now be described. Operations begin at block **300** where the wireless service provider contract with a media broadcaster to rebroadcast streaming media content over the service provider's wireless network, such as the wireless network **140** of **FIG. 2**. At block **310**, the consumer subscribes to one or more streaming media services provided by the wireless service provider to gain access to the rebroadcast of the streaming media content. Once the consumer has subscribed to the streaming media service, the consumer may use an interface provided by a mobile terminal to tune in to the streaming media content that is rebroadcast over the wireless network. The mobile terminal may provide a menu to identify channels of content by station identification, call letters, AM or FM frequency, or other types of identifiers.

The consumer may subscribe to a streaming media broadcast on a pay per view (PPV) basis or on a monthly subscription charge basis, in accordance with various embodiments of the present invention.

[32] The flowchart of **FIG. 3** illustrates the architecture, functionality, and operations of some embodiments of methods, systems, and computer program products for transmitting streaming media to a mobile terminal using the bandwidth associated with a wireless network. In this regard, each block represents a module, segment, or portion of code, which comprises one or more executable instructions for implementing the specified logical function(s). It should also be noted that in other implementations, the function(s) noted in the blocks may occur out of the order noted in **FIG. 3**. For example, two blocks shown in succession may, in fact, be executed substantially concurrently or the blocks may sometimes be executed in the reverse order, depending on the functionality involved.

[33] Many variations and modifications can be made to the embodiments described herein without substantially departing from the principles of the present invention. All such variations and modifications are intended to be included herein within the scope of the present invention, as set forth in the following claims.